

A NEW FOSSIL KOALA FROM QUEENSLAND AND A REASSESSMENT OF
THE TAXONOMIC POSITION OF THE PROBLEMATICAL SPECIES,
KOALEMUS INGENS DE VIS

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ABSTRACT

A new species of fossil koala, *Phascolarctos stirtoni*, is described from the cave and fissure fill deposits of the Cement Mills limestone quarry, south-eastern Queensland, together with a discussion on the taxonomic position of the supposed koala, *Koalemus ingens* De Vis, which is considered to be referable more likely to the Diprotodontidae.

The presence of fossil marsupials in cave and fissure fill deposits in Queensland has been noted by Longman (1925, 1945) and Woods (1960), material having been derived from the limestone quarries at Marmor, south-east of Rockhampton, and Cement Mills, near Gore, south-west of Warwick. In addition, Woods (1960) has recorded bone from caves in the vicinity of Mt. Etna, near Rockhampton, and from Mingoola and Glenlyon, between Texas and Wallangarra.

While several marsupials, of both extinct and extant species have been reported from the occurrence at Cement Mills, the faunal list is by no means complete, and this study presents the first evidence of the existence of phalangerid remains in the deposits.

A supposed fossil koala, *Koalemus ingens* has already been recorded from the Upper Cainozoic fluvial deposits of south-eastern Queensland. This, however, appears to have been derived most likely from one of the smaller diprotodontids of the Chinchilla Sand, of possible Pliocene age.

A copy of the data treated statistically in this study has been lodged in the library of the Queensland Museum. All measurements throughout are in millimetres.

***Phascolarctos stirtoni** sp. nov.**

(Pl. 9, figs 1-3)

MATERIAL: F5707, holotype, partial right maxilla with $P^3 - M^2$, juvenile, Cement Mills, near Gore, south-east Queensland, of Pleistocene age.

DIAGNOSIS: Considerably larger than the living *Phascolarctos cinereus* (Goldfuss); $P^3 - M^2$ with strong accessory ridges and molars with strong lingual ridge across extremity of median valley.

DESCRIPTION: Known only from $P^3 - M^2$.

P^3 moderately large, elongate, its length being slightly less than that of M^1 , subovate in basal outline, broader posteriorly than anteriorly. Crown with moderately low, sinuous longitudinal crest and low, anteriorly convergent lingual cingulum, confining a moderately broad lingual basin; longitudinal crest highest posteriorly, transected by two sets of vertical labial and lingual ridges between the anterior and posterior cusps; cuspules produced at crest; extensions of longitudinal crest extend postero-lingually towards crown base, and anteriorly to high anterior cuspule; anterior extension ornamented by single, vertical, lingual ridge between cuspule and anterior cusp; labial and lingual ridges descend from anterior cuspule. Lingual cingulum incomplete posteriorly, slightly raised mesially and anteriorly united with lingual ridge from between anterior ridge and cuspule; lingual ridge from posterior cusp of longitudinal crest also unites with lingual cingulum. Labial ridges from posterior and anterior cusps of crest descend towards crown base. Lingual basin crossed by extensions of ridges from cuspules and anterior cusp of longitudinal crest, and mesially by strong ridge from elevated portion of lingual cingulum; minor ridges also present anteriorly and posteriorly across lingual basin.

$M^1 < M^2$; molars subselenodont, broad, subrectangular in basal outline, with labial and lingual margins somewhat convergent posteriorly; anterior breadth of M^1 slightly greater than that of M^2 . Cusps low, sharply defined. Paracone with well-defined angular ridges; one descends antero-labially to extremity of crown at junction of low anterior cingulum and slight labial cingulum, another curves postero-labially to unite with raised portion of labial cingulum at cuspule at extremity of median valley, while another descends postero-lingually into median valley; subdued ridge descends antero-lingually; labial and posterior surfaces concave while antero-lingual aspect generally convex, giving paracone a subcrescentic appearance; variable accessory ridges descend anteriorly and lingually and to a lesser degree posteriorly. Protocone with well-defined angular ridges; one descends antero-labially to unite with anterior cingulum lingual to axis of crown, another curves postero-labially to unite with antero-labial

* Named for the late Professor R. A. Stirton, who did so much to stimulate recent work on Australian fossil marsupials.

ridge from hypocone, above median valley; lesser ridge descends labially, subdivides labial concave surface of cusp; slight variable ridge descends antero-lingually to crown margin, from protocone or from its antero-labial ridge, occasionally unites with lingual, discontinuous extension of anterior cingulum, and anterior margin of moderately high, short, lingual cingulum; antero-lingual aspect of cusp generally convex, giving cusp a subcrescentic appearance; variable accessory ridges at base of cusp surfaces developed anteriorly, lingually and postero-lingually. Metacone with well-defined angular ridges; one descends antero-labially to raised portion of labial cingulum at cuspule at labial extremity of median valley, another postero-labially to margin of crown, uniting with extremities of labial and low, posterior cingula; labial aspect of cusp concave, while lingual aspect convex, giving cusp a crescentic appearance; variable accessory ridges descend antero-lingually, lingually and particularly postero-lingually. Hypocone with well-defined angular ridges; one descends antero-labially to unite with postero-labial ridge from protocone, and another curves postero-labially to unite with posterior cingulum above axis of crown; lesser ridges descend antero-lingually to unite with posterior limit of lingual cingulum, and labially, subdividing concave labial surface of cusp; lingual aspect of cusp generally convex, giving hypocone a subcrescentic appearance; variable accessory ridges developed antero-lingually and lingually towards bases of cusp surfaces. Strong, ornamented accessory ridges developed sub-parallel to crown axis from anterior cingulum, between paracone and protocone, while variable transverse ridges developed in labial moiety of median valley. Fossettes developed antero-lingually, and in lingual moiety of median valley.

DISCUSSION: Many of the early specimens collected from Cement Mills were from unconsolidated or consolidated reddish cave earths. Recently collected material, including the holotype of *Phascolarctos stirtoni*, are almost invariably from consolidated cave and fissure fill in the Palaeozoic Cement Mills limestone. It is probable that some age differences exist, but the deposits at present show no evidence of stratification, and no precise information is available regarding the disposition of the specimens within the deposit. A Pleistocene age is presumed for the Cement Mills material, because of the reasonably high proportion of extinct species, but because of the presence of species still extant, at least some of the deposit may have accumulated during the late Pleistocene.

P. stirtoni is somewhat similar morphologically to the modern koala, *P. cinereus* (Goldfuss). It lacks a postero-labial cuspule on P^3 and has its longitudinal crest only slightly sinuous. However, the cuspule is sometimes absent in *P. cinereus* and while the crest is usually markedly sinuous in that species, it is variable in this feature. Accessory ridges in P^3 and the anterior molars in *P. stirtoni* are stronger than is usual in *P. cinereus*, while the ridge across the lingual margin of the median valley of the molars is stronger. The antero-lingual fossette present in the molars of *P. stirtoni*, is generally absent in *P. cinereus*.

TABLE 1

MEASUREMENTS FOR *Phascolarctos stirtoni* SP. NOV., AND SUMMARY OF MEASUREMENTS
FOR *P. cinereus* (GOLDFUSS)

| Character | Holotype <i>P. stirtoni</i> | <i>P. cinereus</i> —Summary of Measurements | | | | |
|-----------------------------|--------------------------------|---|---------|-----------|--------|-----|
| | | N | OR | \bar{X} | s | V |
| P ³ length | 9.7 | 41 | 6.7–8.3 | 7.3 | 0.3931 | 5.4 |
| breadth posteriorly | — | 42 | 4.7–5.7 | 5.1 | 0.2934 | 5.8 |
| M ¹ length | 10.8 | 42 | 7.3–8.7 | 8.0 | 0.3639 | 4.5 |
| breadth protoloph | 10.4 | 42 | 7.1–8.2 | 7.7 | 0.2922 | 3.8 |
| M ² length | 10.7 | 45 | 7.2–8.2 | 7.7 | 0.2594 | 3.4 |
| breadth protoloph | 11.2 | 46 | 7.3–8.8 | 8.0 | 0.3051 | 3.8 |

In size, however, *P. stirtoni* is considerably larger than *P. cinereus*, as can be seen from the accompanying table of measurements, the fossil exceeding by more than one-third the mean values for the recent species in the sizes of its teeth. This is graphically illustrated in Figure 1. Size differences are apparent between study skins of the southern and northern subspecies of *P. cinereus*, but there are no significant differences in the dimensions of the teeth. Although the sample of the Victorian koala was insufficient for statistical consideration, measurements for individuals fall well within the limits of the Queensland subspecies, *P. c. adustus*.

Stephenson (1963) has argued that intra-specific isometric growth gradients may have played an important role in the evolution of Australian marsupials and monotremes, and that the Quaternary decrease from Pleistocene to Recent forms may be as much as 20–25 per cent. Even allowing for the fact that *P. stirtoni* cannot be compared statistically with the living koala, it is apparent that the size difference alone is too great for this to be considered as simply intra-specific variation.

Glauert (1910) records the presence of the modern koala, *P. cinereus*, in the Pleistocene deposits of the Mammoth Cave, in south-western Western Australia. His measurements for this material conform with those for the recent sample.

A fossil phalangerid of somewhat doubtful affinities, *Perikoala palankarinnica*, was described by Stirton (1957) from the Palankarinna fauna of the possibly early Pliocene Mampuwordu Sands of the Tirari Desert, Lake Eyre Basin, South Australia, but was later referred to the Upper Oligocene Ngapakaldi fauna (Stirton *et al.*, 1961). While this cannot be compared morphologically by direct means with *P. stirtoni*, being based on a partial left mandibular ramus with P₃–M₂, it is considerably smaller than *P. cinereus*, and is obviously generically distinct.

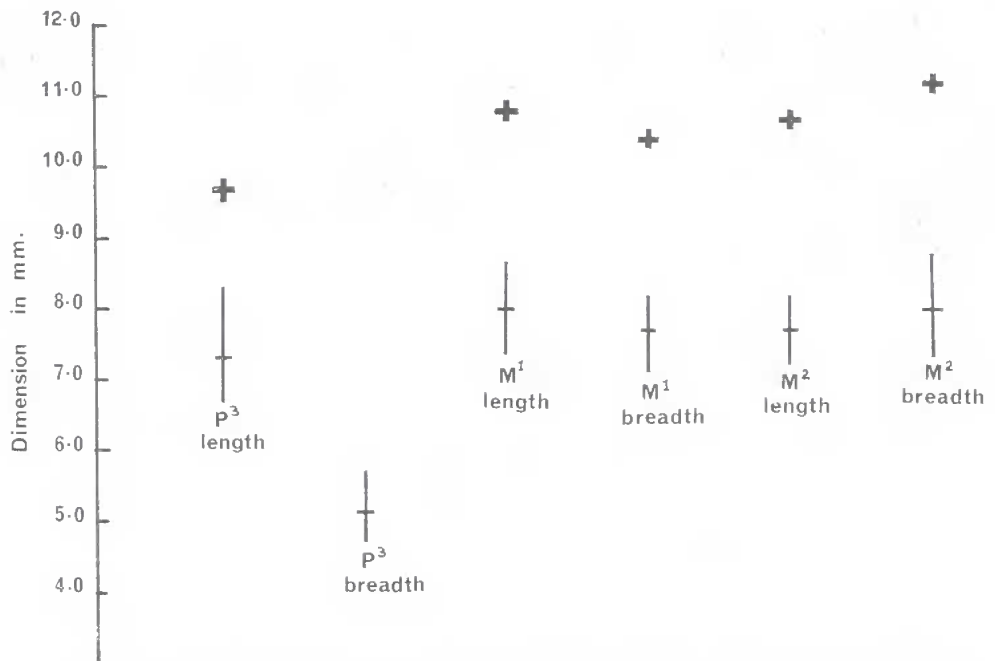


FIG. 1: Comparison of measurements of *Phascolarctos stirtoni* sp. nov. and *P. cinereus* (Goldfuss), with heavy crosses for *P. stirtoni*; light vertical lines represent observed ranges, while horizontal bars represent position of sample means of *P. cinereus*.

THE TAXONOMIC POSITION OF KOALEMUS INGENS DE VIS, 1889

Since its description, *Koalemus ingens* De Vis, has remained something of an enigma in the fauna from the Upper Cainozoic fluvial deposits of the Darling Downs area, south-eastern Queensland. The holotype, F683, the distal end of an incomplete right fibula, unfortunately lacks precise locality information. However, it is heavily mineralised, hard and stained by oxides of iron, suggesting a likely provenance within the Chinchilla Sand, of possible Pliocene age.

It was fully described by De Vis (1889), and its resemblance with the fibula of the modern koala, *P. cinereus*, was noted. De Vis considered the specimen as a left fibula when, in fact, it comes from the right limb. Beside its moderately large size, the main morphological characters presented by the holotype include a deep, semilunate, external, lateral surface of the epiphysis, this being bounded anteriorly by an expanded, somewhat posteriorly rotated process and posteriorly by a much reduced process. The antero-lateral surface of the epiphysis is also expanded, but the postero-lateral and posterior surfaces are nearly planar. Loss of bone has occurred on other lateral epiphysial surfaces. In distal view, the epiphysis generally slopes postero-mesially,

and is marked by a postero-lateral depression below the postero-lateral process. A shallow depression delimiting the elevated antero-lateral process is also present. Mesially, the surface is broadly convex, the convexity increasing anteriorly. The shaft is subquadrate in section and is moderately strong. It is flattened externally and posteriorly, these surfaces meeting in an angular ridge which continues distally to the postero-lateral epiphysial process. The other surfaces of the shaft are rounded, with a broad ridge ascending from the antero-lateral epiphysial process and a short, broad ridge ascending postero-mesially.

While a general structural resemblance does exist between the fibulae of *K. ingens* and *P. cinereus*, numerous differences are apparent. In particular, the antero-lateral process in *P. cinereus* is less expanded in both external and distal views, and is not as rotated as in *K. ingens*. The semilunate lateral aspect is more constricted, while in distal view, the antero-lateral process is isolated by a deep, broad groove. The shaft lacks the postero-lateral angularity visible in *K. ingens*, and anteriorly bears a somewhat angular, longitudinal ridge.

As a supplement to his original description, De Vis (1889) described and referred to *K. ingens* a left premaxilla and attached partial maxilla. This cranial fragment, F684, again lacks detailed locality information, but appears to have been derived from the Chinchilla Sand, by its preservation. It is definitely referable to a koala, and indicates a size difference of about one-half as large again as *P. cinereus*. The fibula described as *K. ingens* is about twelve times as large as that in the recent koala, and this prompted De Vis to estimate the weight of the animal as five hundred-weight or more.

De Vis (1889) attempted to explain the discrepancies in size between the two by suggesting that the cranial fragment had been derived from a juvenile individual. This, however, is not the case because of the extensive wear facets present on I³ and C¹, the only teeth retained in the specimen, and by the nature of the premaxilla-maxilla suture. In size, this fragment compares favourably with *P. stirtoni*, but insufficient evidence is present for its relationship to be considered at this time.

Since, in general, in the Darling Downs deposits, post-cranial remains of marsupials have not been found associated with cranial remains, upon which most of the species are based, any reassessment of the taxonomic position of *K. ingens* must, of necessity, be fairly broad. On the basis of size and morphology, only the families Vombatidae and Diprotodontidae bear consideration.

Only *Phascolonus gigas* Owen, among the Vombatidae, is sufficiently large to warrant comparison. However, the fibula of this species is known, having been described by Stirling (1913), and is quite distinct from that of *K. ingens*.

Among the Diprotodontidae only the smaller forms of the Chinchilla Sand, namely *Euowenia* De Vis and *Palorchestes* Owen, could presumably have accounted for an adult fibula, the size of that of *K. ingens*.

It is believed that reference of *K. ingens* to the Diprotodontidae, regardless of the fact that it cannot be associated with a particular species, is preferable to its present taxonomic assignment within the Phalangeridae.

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MEMOIRS OF THE QUEENSLAND MUSEUM

PLATE 9

FIGS 1, 2: Stereopair of occlusal view, F5707, holotype, *Phascolarctos stirtoni* sp. nov.

FIG. 3: Labial view of F5707, holotype, *P. stirtoni* sp. nov.

FIG. 4: Distal view of F683, holotype, *Koalemus ingens* De Vis.

FIG. 5: Posterior view of F683, holotype, *K. ingens* De Vis.

FIG. 6: External view of F683, holotype, *K. ingens* De Vis.

